

Vashon-Maury Island Child-Use Areas Study 2000-2001

Executive Summary: Preliminary Data Evaluations

Study Design: A survey of Vashon-Maury Island forested areas in 1999-2000 showed significantly elevated arsenic and lead concentrations in near-surface soils. Based on those findings, the Vashon-Maury Island Child-Use Areas Study was conducted to address concerns over exposures to children in areas where they could have frequent contact with soils. The Child-Use Areas Study was funded by Ecology and performed by Public Health - Seattle & King County. A primary goal of the study was to provide enough data to decide whether early cleanup actions should be taken at any of the sampled child-use areas.

A total of 1,503 soil samples from 34 child-use areas was collected and analyzed for arsenic and lead. Each child-use area had one or more designated decision units (DUs), with soil samples collected in each decision unit from multiple borings and at multiple depths in each boring. The decision units represent distinct areas within a property where children play and which could be considered separately for cleanup decisions. Child-use areas were located in three defined zones on Vashon-Maury Island (south to north), reflecting the general patterns and gradients in soil contamination levels from the initial survey. Child-use areas included public and private schools, public parks and beaches, daycare centers, preschools, and camps.

Public Health staff collected soil samples between August 28 and November 8, 2000. Laboratory analyses were performed by OnSite Environmental, Inc. (Redmond, WA). Except for beach DUs, all samples were analyzed as discrete samples (one depth interval in one boring). Data validation was performed by EcoChem, Inc. (Seattle, WA). Based on the data quality assessments, all results reported by OnSite were acceptable for evaluating the child-use areas.

Preliminary Findings: A Final Report on the Child-Use Areas Study is being prepared. A summary of the findings from preliminary evaluations of the patterns in soil contamination is provided below. Decisions on the need for early cleanup actions (Interim Action evaluations) are reported separately.

Magnitude of Contamination. The Child-Use Areas Study provides the first extensive survey of arsenic and lead on Vashon-Maury Island beaches. All 16 beach DUs had low arsenic and lead concentrations, regardless of location. The maximum arsenic and lead values were only 2.8 ppm and 19 ppm, respectively (samples at the same depth interval from all borings were combined for analysis at beach DUs). Ecology's default soil cleanup standards are 20 ppm for arsenic and 250 ppm for lead.

The 49 non-beach DUs had maximum arsenic concentrations ranging from 8.9 to 130 ppm, and maximum lead concentrations from 12 to 900 ppm. The maximum values were lower than in the initial survey of forested areas, and the total data set included relatively few high values. Nevertheless, more than 70 percent of the non-beach DUs had a maximum arsenic concentration exceeding Ecology's 20 ppm cleanup standard. Sampling in child-use areas thus confirmed the initial survey finding of contamination, to one degree or another, over most of Vashon-Maury Island.

Spatial Pattern. Maury Island, south Vashon Island, and the eastern part of mid-Vashon Island showed the highest arsenic and lead values. This spatial pattern closely matches the results of the initial survey of forested areas. Two "outlier" high lead DUs (one on north Vashon, the other on the western shoreline) both had low arsenic levels and likely represent a different source for lead.

Relationship of Arsenic and Lead. Arsenic and lead concentrations were strongly associated, with lead values typically two or three times greater than arsenic. The lead-to-arsenic ratio varies over a broader range from sample to sample.

Depth Profiles. For the study as a whole, arsenic and lead concentrations are generally higher in the top 6 inches than at greater depths. Exceptions to this general pattern occur - at about 30 percent of DUs, for example, the maximum values occur below 6 inches - which is likely the result of property development and soil-disturbing actions. Arsenic appears to move downward more than lead within the top 6 inches.

Variability in Concentrations. Arsenic and lead concentrations vary substantially over quite small areas, such as within a single DU. As a result, average concentrations are much lower than maximum concentrations. Arsenic and lead values can also vary significantly from one child-use area to another, even when those sampling areas are located close together.

Conclusions. The Island-wide pattern of soil contamination at child-use areas was similar to that reported for forested areas in 1999-2000, but the concentrations of arsenic and lead were generally lower. The majority of sampled DUs had one or more results above Ecology's cleanup standards. Arsenic and lead results showed a strong association, with elevated levels occurring for the most part at the same DUs. Arsenic and lead levels were generally higher in the top 6 inches of soil, although maximum concentrations occurred at all sampled depths.

Interim Action Decisions: Ecology and Public Health have evaluated the sampling results for each DU to make decisions on the need for early cleanup actions. Those evaluations are reported in a separate *Interim Action Memo*. Each DU in the Child-Use Areas Study has been assigned one of the following classifications: 1) Further Study in the long-term cleanup process (possibly above Ecology's cleanup standards, below Interim Action criteria), or 2) Confirmational Sampling (possibly above Interim Action criteria).